UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

FEB 28 2002

OFFICE OF
PREVENTION, PESTICIDES AND
TOXIC SUBSTANCES

MEMORANDUM

SUBJECT: Potential for Reduction of Isoxaflutole Use Rates (D278266)

FROM: Virginia Werling, Biologist Virginia Werling 2-28-02
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REVIEWED BY PRP: February 27, 2002

SUMMARY: RD has asked BEAD to review efficacy data (Isoxaflutole: Weed Control Efficacy Data; MRID 454944-01) submitted by the registrant for the herbicide isoxaflutole (Balance® Pro Herbicide) to determine whether it can be used at "lower rates" due to concerns for phytotoxicity and leaching issues. RD noted that isoxaflutole is used at "lower rates" in Europe. At BEAD's request RD refined their request to ask what the efficacy data suggest would be the likely consequences of isoxaflutole use at less than the registered maximum labeled rate of 0.14 pounds active ingredient per acre (lb ai/A) and less than the average current rate of 0.07 lb ai/A(1).

BEAD concludes that isoxaflutole used alone does not provide greater than 90 % control of several weeds common to corn production at rates up to 0.12 lbs ai/A in medium textured soils. However, efficacy data demonstrate that isoxaflutole can be used effectively at 0.07 lbs ai/A (half of the currently labeled maximum application rate of 0.14 lbs ai/A) when used in combination with atrazine or a chloracetamide herbicide applied before emergence of weeds. This coincides with the data available from USDA/NASS (2) that indicate the average use rate for isoxaflutole is 0.07 lbs ai/A. Lowering use rates below the maximum application rate may also be possible when combined with atrazine or chloroacetamide herbicides with early pre-plant application timing, however, there is no information on the efficacy achieved when rates are lowered below 0.07 lbs ai/A.

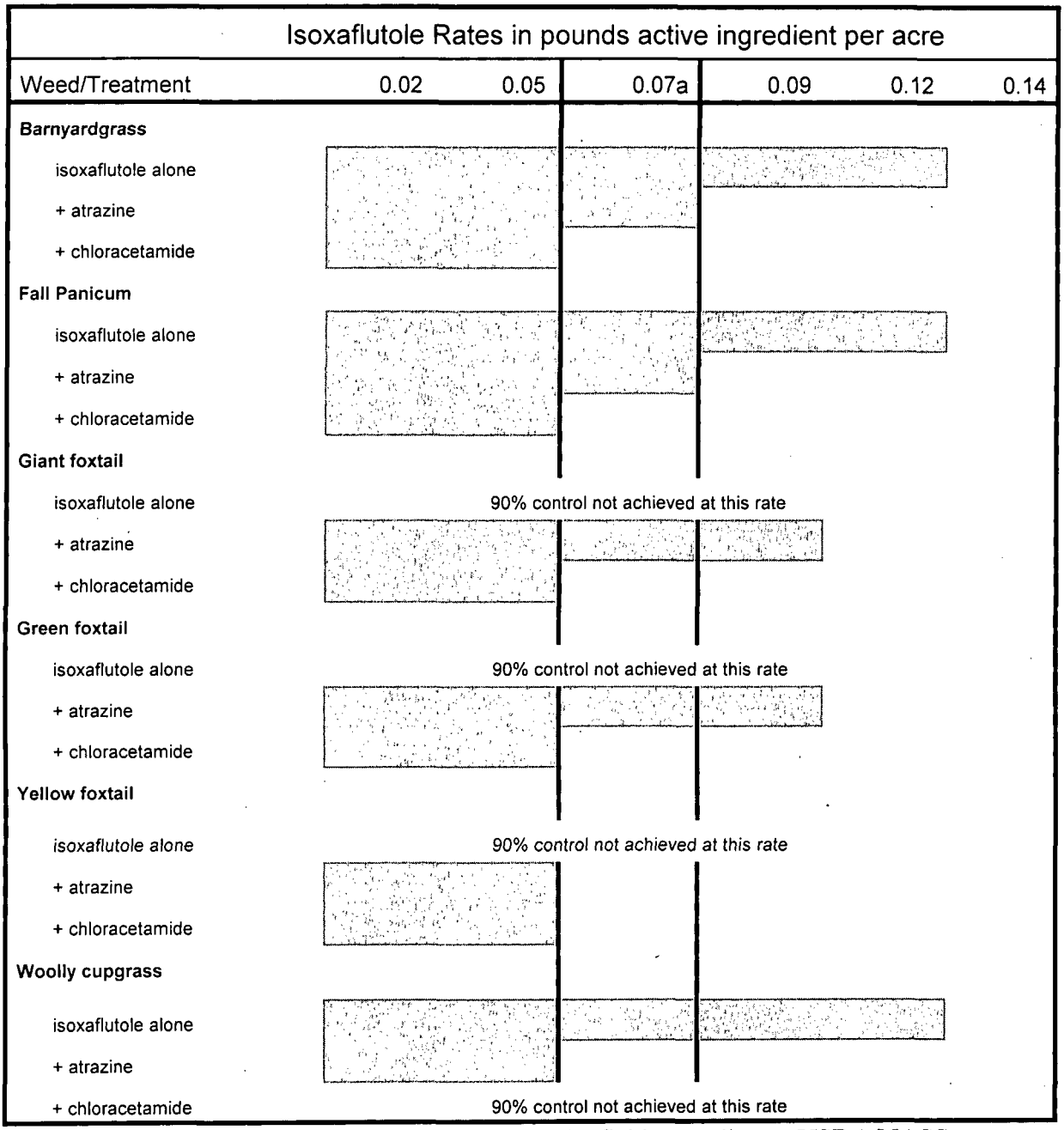
BACKGROUND: Isoxaflutole is currently labeled for use at rates up to 0.14 lb ai/A (2). Different application rates are specified for various soil textures and application timings with higher rates allowed on fine textured soils and early application timing. The current average actual rate per application is 0.07 lb ai/A (3).

REVIEW OF EFFICACY TRIALS: Replicated treatments selected from 733 trials with rate and use patterns consistent with the label use directions were submitted. The weed control evaluations reported ranged from 30 to 70 days after application. Treatments included isoxaflutole applied alone or in combination with atrazine or a chloracetamide herbicide as specified on the BALANCE® Pro Herbicide label. However, not all treatments evaluated in the studies were included; the submission states that "isoxaflutole-atrazine or isoxaflutole-chloracetamide (acetochlor or metolachlor) herbicide combination treatments were excluded when the atrazine rate was greater than 1400 g ai/ha (1.25 lb ai/ac) or when a full rate of chloracetamide herbicide was used to be consistent with the isoxaflutole label". Treatments using the industry standards, metolachlor plus atrazine and acetochlor plus atrazine were also included. This review will not discuss the efficacy of the industry standards since the request was limited to isoxaflutole.

Summaries of the efficacy trials for pre-emergent control classified by weed species are presented in Tables 1-3 below to demonstrate what rates of an isoxaflutole-containing treatment are required to obtain at least 90% weed control, a level of control generally accepted by growers. In some cases the specified rate did not provide this level of weed control; these cases are marked in the table. The information is presented for grass weeds in medium soils, certain grass weeds in coarse soils and for broadleaf weeds in medium soils. Although data were submitted for fine soils, Aventis claims weed control for medium soils is representative of most corn-growing situations. This seems reasonable, however several soil series that are classified as fine soil texture are located in common corn-growing areas. So a short discussion of the differences in weed control obtained on fine soils has been included.

GRASS CONTROL IN MEDIUM SOILS: To use isoxaflutole effectively at less than the maximum labeled rate, growers would need to combine it with another herbicide, probably atrazine. Table 1 shows that isoxaflutole applied alone at rates up to 0.12 lb ai/A is effective at 90% control for only three of the six grasses tested. If rates of isoxaflutole are dropped to 0.07 lb ai/A, the current average application rate in corn (2), 90% control can be obtained for all grass species by including atrazine in the treatment. And, except for woolly cupgrass, the same can be said for including a chloracetamide herbicide in the treatment. In fact, in some cases isoxaflutole rates of 0.05 lb ai/A provided acceptable control of these weeds, but only when combined with atrazine or chloroacetamides.

Table 1: Rates of Isoxaflutole Needed for At Least 90% Control of Grasses in Medium Soils



a. The average rate of isoxaflutole actually used in the field according to USDA/NASS surveys.

GRASS CONTROL IN COARSE SOILS: In Table 3 isoxaflutole used alone and in combination with atrazine or a chloracetamide herbicide provided at least 90% control of the two grass weeds considered. Both field sandbur and wild proso millet are grassy weeds especially adapted to sandy (coarse) soils (4).

Table 2: Rates of Isoxaflutole for At Least 90% Control of Grass Weeds in Coarse Soils.

Weed Species/ Isoxaflutole Treatment	Isoxaflutole Rates in pounds active ingredient per acre					
	0.02	0.05	0.07a	0.09	0.12	0.14
Field sandbur						
isoxaflutole alone						
+ atrazine						
+ chloracetamide						
Wild Proso Millet						
isoxaflutole alone						
+ atrazine						
+ chloracetamide						

a The average rate of isoxaflutole actually used in the field according to USDA/NASS surveys.

BROADLEAF WEED CONTROL IN MEDIUM SOILS: When applied alone, isoxaflutole controlled only five of the nine species of broadleaf weeds tested at rates up to 0.12 lbs ai/A (Table 3). However, when used in combination with atrazine, isoxaflutole-containing treatments controlled the weeds tested at rates less than the labeled maximum and, in some cases, at rates below the current average use rate of 0.07 lb ai/A. Similar results were obtained with isoxaflutole in combination with a chloracetamide-type herbicide, although the combination was not quite as effective as the atrazine/isoxaflutole combination for cocklebur, morningglory and sunflower.

Table 3: Rates of Isoxaflutole Needed for at least 90% Control of Broadleaf Weeds in Medium Soils

Weed/Isoxaflutole Treatment	0.02 lb ai/A	0.05 lb ai/A	0.07 lb ai/A	0.09 lb ai/A	0.12 lb ai/A	0.14 lb ai/A
Cocklebur						
isoxaflutole alone	90% control not achieved at this rate					
+ atrazine						
+ chloracetamide	90% control not achieved at this rate					
Common Lambsquarters						
isoxaflutole alone						
+ atrazine						
+ chloracetamide						
Morningglory						
isoxaflutole alone	90% control not achieved at this rate					
+ atrazine						
+ chloracetamide						
Pennsylvania Smartweed						
isoxaflutole alone						
+ atrazine						
+ chloracetamide						
Common ragweed						
isoxaflutole alone						
+ atrazine						
+ chloracetamide						
Giant ragweed						
isoxaflutole alone	90% control not achieved at this rate					
+ atrazine	90% control not acheived at this rate					
+ chloracetamide						
Sunflower						
isoxaflutole alone	90% control not achieved at this rate					
+ atrazine						
+ chloracetamide	90% control not achieved at this rate					
Waterhemp						
isoxaflutole alone						
+ atrazine						
+ chloracetamide						

Velvetleaf						
isoxaflutole alone						
+ atrazine						
+ chloracetamide						

a The average rate of isoxaflutole actually used in the field according to USDA/NASS surveys.

EARLY PREPLANT APPLICATIONS: Information was also submitted (no table included in this review) on weed control obtained using early pre-plant application timing. Again weed control from isoxaflutole alone, isoxaflutole plus atrazine and isoxaflutole plus a chloracetamide herbicide were compared. Weed control from application rates ranging from 0.07 to 0.14 lbs ai/A were grouped together; no information on rates lower than 0.07 lbs ai/A were reported for early preplant applications. The best weed control was provided by isoxaflutole plus atrazine; control was about 90% or more for all broadleaf weeds except for annual morningglory (80%). The submission also noted that for cocklebur, annual morningglory and giant ragweed, a post-emergence application of another type of herbicide may be required for adequate control.

WEED CONTROL ON FINE SOILS: On fine soils control very similar to that on medium soils was obtained for weeds except for woolly cupgrass and cocklebur. With woolly cupgrass, 90% control was achieved with 0.09 lb ai/A plus an unspecified rate of a chloracetamide herbicide. Neither isoxaflutole alone or in combination with atrazine provided 90% control of woolly cupgrass in fine soils. With cocklebur, strangely enough, the only treatment that provided 90% control was the lowest rate of isoxaflutole (0.05 lbs ai/A) plus a chloracetamide herbicide. Higher rates of isoxaflutole resulted in poorer control.

CONCLUSIONS: Isoxaflutole used alone does not provide adequate control of several weeds common to corn production, namely giant, green and yellow foxtail as well as cocklebur, morningglory and giant ragweed. Efficacy studies demonstrate inadequate control of these weeds at rates up to 0.12 lbs ai/A of isoxaflutole alone.

Efficacy data demonstrate that isoxaflutole can be used effectively at 0.07 lbs ai/A only when used in combination with atrazine or a chloracetamide herbicide when applied at the pre-emergence application time (half of the currently labeled maximum application rate of 0.14 lbs ai/A). This coincides with the data available from USDA/NASS that indicate the average use rate for isoxaflutole is 0.07 lbs ai/A. Lowering use rates below the maximum application rate may for isoxaflutole also be possible when combined with atrazine or chloroacetamide herbicides with early pre-plant application timing, however, there is no information on the efficacy achieved when rates are lowered below the 0.07 lbs ai/A. Weed control with isoxaflutole on fine soils is a bit more difficult; as rates are lowered control may be lost at higher rates than on medium soils, especially for the weeds woolly cupgrass and cocklebur.

(1) Personal communication between V. Werling and D. Kenny on 2/11/02.
(2) Label for Balance® Pro Herbicide received in electronic form from D. Kenny, EPA on February 5, 2002.
(3) Agricultural Chemical Usage Field Crops, May 2001. Agricultural Statistics Board. National Agricultural Statistical Service, United sates Department of Agriculture.
(4) Weeds of the North Central States. North Central Regional Publication No. 281. Bulletin 772, University of Illinois at Urbana-Champaign.

Appendix A

Conversion of Rates of Isoxaflutole From Grams AI/Hectare to Pounds AI/Acre

Grams AI/Hectare	Pounds AI/Acre
52.5	0.05
66	0.06
79	0.07
105	0.09
132	0.12
158	0.14